Social Housing In Great Metropolitan Areas – A New Methodology For Integrated Quality Evaluation And Comparison

Sergio Martín Blas, Isabel Rodríguez Martín

Research Group NuTAC
Polytechnic University of Madrid, Spain
e-mail: nutac.arquitectura@upm.es

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Abstract
This paper exposes the first experimental application of a method for analysis and comparison of international experiences on social housing in the context of great metropolitan areas. The method, developed in the Polytechnic University of Madrid (UPM) since 2009, is based on the use of common graphic and numerical codes and the integration of different scales of approximation to the built environment; from the house and its architecture, to its materials, building technologies and, reaching further, the city. Additionally, data are linked to three key concepts closely related to the specific conditions of great metropolitan areas: economy, density and diversity. The final aim of the research is to provide a tool for quality evaluation of social housing, resource optimization and innovative design.

1 Introduction: housing in great metropolitan areas

Great metropolitan areas have been an object of controversy since the unprecedented urban explosion that followed the industrial revolution, and especially during the last 50 years. Conurbation, City-Region, Megalopolis, World-city, Megacity, are some of the terms that, with different connotations, have been used to name places where the greatest threats and opportunities for the future of human life have been alternatively identified [1]. Beyond generic threats like environmental aggression or psychological and social disease, great modern cities are undoubtedly the setting of what we call “the housing problem”. From the slums and their hygienic and security troubles, main concern of specific literature until the 60’s [2], to the chronic difficulty of the market to provide affordable housing for the most [3], “the housing problem” has been an unavoidable burden for great cities, where different answers have been historically tested. One of these is the promotion of what we can generically call “social housing”. Under this perspective, social housing may be understood as a specific outcome of great metropolitan areas.

But big cities are not always seen as the warning sign of a catastrophic future. They have also been identified as a source of extraordinary opportunities. In her seminal work of 1961, Jane Jacobs claimed the role of great cities as places for economic development, social exchange and creativity. According to Jacobs, the key concept to understand the specificity of these settlements is **diversity.** Diversity (functional, social, typological mixture and proximity) should be encouraged by public policies, including housing policies [4]. More recently, the traditional vision of big cities as sources of pollution and environmental instability has been balanced by reflections about the ecological opportunities given by the manipulation of **density**, a key concept with extraordinary success since the 90’s [5]. Urban concentration and high densities can be means to avoid sprawl, reduce commuting time and expenses, energy costs, etc. Such concepts are closely related to a vision of great cities as places of collective **economy** based on resource optimization, promotion of synergies, creative transformation and recycling [6].

If social housing was born as an answer to the threat of slums, overcrowding, health disease and social disorder in great metropolitan areas, the question now is whether it can become an instrument to enhance the opportunities that

lie on such urban conglomerates, without giving up its traditional roles. In other words, what is the future of social housing in great metropolitan areas?

The pursuit of a partial answer to this question is the origin of the research introduced in this paper. Its premise is the need to build an analytical framework for the systematic comparison of international experiences on social housing. The progressive connection and convergence of great cities in the global context [7] makes such comparison not only plausible, but even unavoidable to attain significant results. Berlin, Paris, Madrid, Sao Paulo, Mexico City, Montreal, New York, Tokyo, Shanghai or Istanbul still keep important differences and a strong sense of the place, but they present also growing similarities. Most significantly, these cities face increasingly similar problems, including the "housing problem", often considered a local and hardly comparable issue [8]. Thus, the convergence of great metropolitan areas offers the opportunity to build a new shared knowledge, in this case through the comparative analysis and exchange of social housing practices.

2 Research on social housing: comparative analysis

Social housing has been a fundamental research field for architects from the beginning of the past century. Initially, attention was mainly focused on minimal housing to fulfill the basic needs of low income families, who were living in unfit and unhealthy conditions. Eventually, theoretical research in this field adopted the analytical methodology known to other sciences. The fundamental milestone of the period was the 1929 CIAM held in Frankfurt under the slogan "Die Wohnung für das *Existenzminimum"* [9]. Following the work of the German architect Alexander Klein [10] and the graphic codes developed by the Swiss designer Otto Neurath [11], the organization asked each country's committee to submit one or more examples of minimal dwelling illustrated through schematic drawings and some basic numerical data. Graphic and data consistency allowed for direct comparison between the samples, although these were uprooted from their urban/territorial context.

The Frankfurt congress opened a fundamental path for the research on social housing with analytical tools, supported by an international framework of practice exchange. But it is well known that the full development of modern analytical ambitions applied to architectural design and urban planning came during the 1960's. On one hand, with the emergence of cybernetics and the so-called "systems revolution" [12]. Works like Christopher Alexander's reduced the problem of residential design to the selection and combination of data through mathematical models, suggesting the possibility of what Tafuri called an *architecture ex-machina* [13] [14]. On the other hand, as a partial answer to such oversimplification, the late 60's witnessed the blooming of the so-called typo-morphological approach, represented by Rossi and Grassi in Italy, and Panerai in France, among others [15]. For this second school, housing was mainly a built form rationally related to urban form, and it should be studied with the tools of morphological classification and typology, and so with specific architectural tools.

In a simplified vision, it can be said that this second research line won the match in the late 70's and 80's, when the distance with the systems approach of the 60's became evident. The hypothetical "scientific" solution to the "housing problem" was seen as a simple side-effect of modernity's naïve faith in science and technology and its emphasis on quantitative methods. Housing, architectural or city quality cannot be broken down to a number. Besides, it's evident that the "housing problem" cannot be isolated from its urban context, as many of the modernists "housing experts" implicitly did.

Despite these reflections, in the last two decades we have been witness to a true revival and multiplication of studies that follow the candid analytical premises of the "systems revolution" period, supported by the extraordinary development of computational means. From the sociological approach of "Space Syntax" diagrams [16], post-occupancy evaluation (POE) combined with comparative floorplan analysis (CFA) [17], to the technological elaborations of computer simulation for low-energy design [18], computer aided architectural design (CAAD) [19], parametric evaluation, decision support systems (DSS) [20] or case-based reasoning (CBR), etc, a true feast of data, parameters, diagrams, tables, algorithms, software, and acronyms has served to transform housing design and evaluation from a kind of craft based on personal intuition and knowledge into an allegedly scientific activity. Thus the known problems of the "systems approach" seem to perpetuate. Quoting Peter Hall, such approach has been identified, consistently with its military origins, with the use of "pseudo-science and incomprehensible jargon to create a smokescreen, behind which ethically reprehensible policies could be pursued" [12]. In a less paranoid reading, the utterly intricate vocabulary and mathematical paraphernalia of such studies seem to widen the already worrying distance between

academic theoretical research and the average professional and institutional practitioners that deal with housing design. The alternative is probably not so much the return to purely intuitive procedures, but the moderate use of data processing, analytical methods and artificial intelligence, always subordinated to natural intelligence, and to more specific means of qualitative research, like architectural drawings.

Figure 1. I+D+VS Exhibition panels: the integrated method applied to eight international social housing cases (Madrid, Barcelona, Nantes, Zurich, Groningen, Amsterdam, Gifu).

3 Towards a new methodology for integrated quality evaluation.

This paper exposes the first experimental application of a method for analysis and comparison of international experiences on social housing in the context of great metropolitan areas. The method was developed by the research group NuTAC (New Techniques, Architecture, City) in the Polytechnic University of Madrid (UPM) since 2009, as part of the National Research Project *New Techniques and Social Housing.* Its applications were anticipated in the exhibition I+D+VS: FUTURES OF SOCIAL HOUSING IN 7 CITIES, held in Madrid in 2010 [21].

The method can be interpreted as the crossing of two research traditions. First, the typo-morphological studies based on the comparative analysis of architectural drawings, and more precisely the tradition of the housing atlas. Recent examples of this concept are the successful *Atlas of the Dutch Housing Block* [22] or the *Atlas du Logement* promoted from the EIA-Fribourg [23]. Through the unification of graphical codes and scales, housing atlases make possible the direct comparison and classification of architectural and urban solutions, and are the most direct means of gathering and ordering specific architectural knowledge. Second, the analytical systems for housing evaluation based on numerical values, and particularly the institutional methods known in European countries like France (Qualitel), UK (HQI), and Switzerland (SVA) [24]. These methods offer a clear connection to harsh facts, far from purely theoretical constructs about “how things should be”. Such a method still does not exist in countries like Spain, even if housing analysis systems have been tested in different forums in the last years [25] [26].

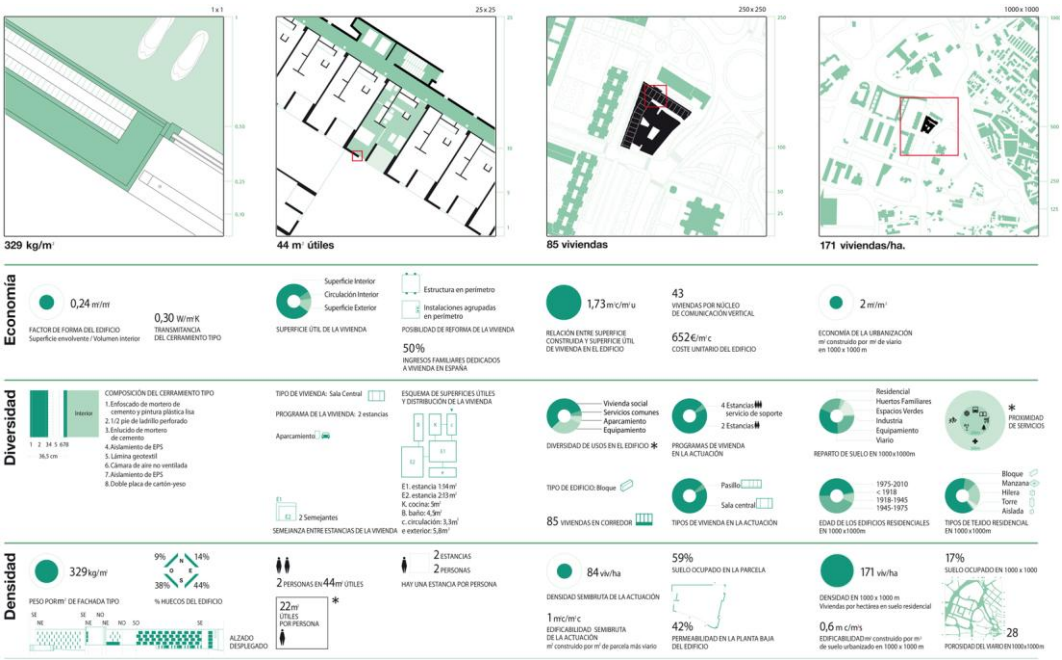


Figure 2. Analysis of a mix-use social housing building in Barcelona, Spain.

Taking these precedents into account, the new method proposes the use of common graphic and numerical codes for the analysis and comparison of social housing samples in different metropolitan contexts. Its most relevant premises are:

a. Integration of different scales. The method observes the built environment across different scales, stressing the indissoluble relation between architectural types and forms, urban patterns and building technologies.

b. Subordination, simplification and visibility of numerical values. The method acknowledges the limitations of data compilation, treatment and evaluation, and includes it as a part of more complex procedures where other individuals' criteria and responsibilities should prevail. Furthermore, the selection of pertinent data, the criteria for simplified calculation and the search of intuitive graphical representation are central points of the method, assuming, as Jaques Bertin points out, that "understanding means simplifying, reducing a vast amount of "data" to the small number of categories of "information" that we are capable of taking into account in dealing with a given problem" [27].

c. Explicit key concepts linking the scales. The method proposes three key concepts related to metropolitan development and social housing (diversity, density and economy) as a means of conflating numerical and graphical materials at different scales with more general goals (ideological, political, social). Explicit concepts avoid the presentation of analytical systems as purely technical devices, in which deep assumptions and goals are darkened by the system's self-justified *apparatus*.

The method has been applied experimentally to eight international cases, selected by their capacity to encompass ideas for the future of social housing in great metropolitan areas, related to the three mentioned concepts. The cases enact diverse ways of public intervention in the housing market, commonly grouped under the term "social housing". The phases of the method could be summarized as: graphical analysis, data extraction, evaluation and comparison.

4 Phases Of The Integrated Method

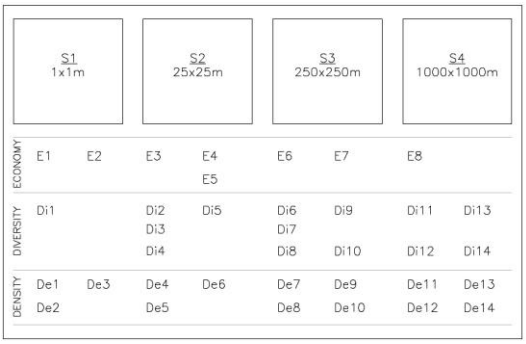
4.1. Graphical Samples: Traversing Scales

Of each case study four graphical "samples" are taken, four framed plan drawings that allow putting the building in different contexts:

1. 1000x1000 meters, depicts the building within the surrounding urban fabric. It shows the latter's texture as well as its degree of concentration or dispersion, continuity or fragmentation.

2. 250x250 meters, displays the basic logic of the housing units aggregation scheme within its immediate surroundings and allows for the observation of public space quality or the morphology of communal spaces (access, stairs, etc) within the building.
3. 25x25 meters, presents the housing unit's internal arrangement and its relationship with the building.
4. 1x1 meters, pictures the façade and its constructive elements.

The simplification of graphical codes is fundamental for the display of morphological properties with a certain "objectivity". The sequence of samples draws inspiration from the 9 minute short film "Powers of Ten", produced in 1968 by Charles and Ray Eames, a true essay on both the relative size of things and the continuity of all the scales of approximation to reality. Furthermore, each of the samples is shown as a "cutout", a "cut" drawing, in Manuel de Solà-Morales words [28]. This is an important conceptual condition: the building or the house plans are not isolated as independent pieces, but integrated within a drawing that fills the frame and, virtually, goes beyond it, as reality does.



ECONOMY
S1: E1.Envelope area/total volume. E2.U–Value wall(W/m²K).
S2: E3.Useful floor area of the dwelling. E4.Adaptability of the dwelling. E5.Dwelling price/Income
S3: E6.Gross floor area/useful area. E7.Dwellings served by each core. E8.Construction budget.
S4: E9.Urbanization economy (streets sqm/total area)

DIVERSITY
S1: Di1.Diversity of materials.
S2: Di2.Type of dwelling. Di3.Programme. Di4.Room use flexibility. Di5.Plan layout scheme.
S3: Di6.Mix of uses. Di7.Building type. Di8.Types of housing units aggregation. Di9.Dwelling programmes diversity. Di10.Dwelling types diversity.
S4: Di11.Functional mix. Di12. Age variety of housing bulidings. Di13.Proximity of public facilities. Di14.Residential fabric types.

DENSITY
S1: De1.Kilograms per façade sqm. De2.Elevation. De3.% of façade openings.
S2: De4.Persons per dwelling. De5.Floor area per person. De6.Number of rooms per person.
S3: De7.Residential density(dwelling/hectare). De8.Floor area ratio. De9.Covered area on the plot. De10.Ground floor permeability.
S4: De11.Residential density(dwelling/hectare) De12.Floor area ratio. De13.Covered area. De14.Street grid permeability.

Figure 3. Description of selected data and numerical indexes

4.2. Data extraction: three essential concepts

All the graphic samples of each of the eight selected projects have been subject to the same analysis and parameter extraction protocol to obtain a set of relevant data and numerical indexes. Most data derive from drawings' "transparencies" (layers of graphic information), allowing for error checking within the drawings themselves. Significantly, data are linked to three closely related key concepts which embody, as mentioned above, other fields of research about great metropolitan areas. These key concepts are applied through the different scales of observation of the built environment, entailing subtle variations of their meaning.

A. The first one, DIVERSITY, evidences the importance of a balanced combination and optimal distance between different items - activities, social groups, ways of life, materials, etc. Diversity and the factors that produce it on a metropolitan context were the subjects of Jane Jacobs' studies in the early sixties [4]. Street grid permeability, public space's clear definition, proximity and openness of ground floor plans, mixed uses (residential, office, leisure, etc.), contrasting building forms and coexistence of buildings of assorted ages in the same neighborhood, are some of the "diversity generators" studied by Jacobs and incorporated to the analysis.

B. Amongst these generators, DENSITY speaks of the relationship between the number of items and the land/space they take up. Given its current relevance, density stands as a second key concept by itself. Floor area ratio, dwellings per hectare, occupants per dwelling or kilograms per square meter of façade are different conjugations of density with subtle connotations each.

C. Density is tightly tied to ECONOMY, the third and last key concept concerning the balance between resource optimization and the satisfaction of needs and wishes. A commitment which is mandatory for any architecture that claims to be "social", and goes beyond the contemporary fixation for words like "sustainability" or "recycling".

These three concepts hold together the output of the analysis. Some data could be filed under more than one key concept or, even, create a new key concept altogether. That is the case of the flexibility and adaptability analysis of the dwelling, connected with both economy and diversity. However, the three key concepts are not to be assumed as disconnected but strongly woven and tightly connected.

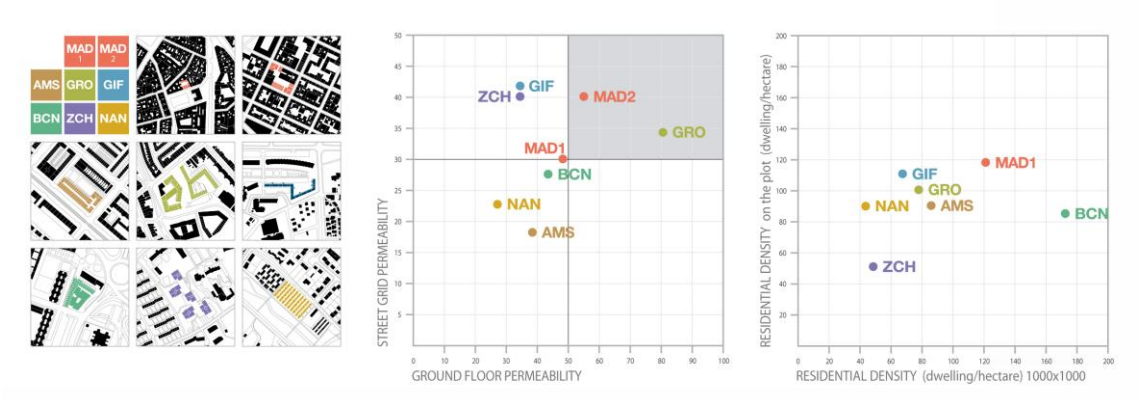


Figure 4. Comparative tables: 250x250m samples, public space quality and density analysis.

4.3. Comparative Analysis And Evaluation

Once the graphical samples and associated data are obtained, their first comparative analysis and evaluation come from the simple juxtaposition of samples, and the combination of two or more data in a single graphic. Of course the discrete number of analyzed cases (8) does not possibly yield any general conclusion, but is enough for a first methodological test. At this stage the interest of the simple combination of data associated to the same key-concept at different scales is however evident. For example, tables that cross diversity, density or economy numbers at neighborhood (1000x1000m) and building-plot (250X250m) levels make clear how housing buildings perform in their contexts, increasing or reducing significant parameters. Numerical combinations and graphics are subordinated to the morphological comparison of plan drawings, from which qualitative conclusions may be inferred.

5 Possible Applications

This method for comparative social housing analysis has been initially developed as an open tool for public and private promoters of social housing in great metropolitan areas, with several possible applications:

A. Integrated evaluation of realized housing interventions. Numerical data can be processed and combined through the attribution of different weighted values, and morphological qualities made explicit from drawings. Weights should be coherent with the three key concepts, acknowledging the relative importance given to resource optimization, generation of diversity and promotion of density.

B. Innovative design feedback. Many public and private social housing promoters assume innovation as one of their main objectives, but lack a formal procedure to identify such innovations and incorporate them to future design. The method provides a tool to build on cumulative knowledge based on a systematical selection and study of evidence from known cases.

C. Design and competition guidelines. The integrated method provides a tool for the direct comparison of design competition entries. It doesn't intend to substitute personal knowledge and intuitive decisions, but to provide the basic necessary information to avoid arbitrariness. More generally, conclusions based on comparative analysis could be applied to new interventions.

6 Conclusions

This paper introduces the first formulation and experimental application of a new integrated method for comparative social housing analysis in great metropolitan areas. The study of precedents and current methods demonstrates the need to combine the frequently contrasting traditions of typo-morphological studies and numerical analytical systems into a new integrated method, characterized by its apparent simplicity and the crossing of several observation scales through explicit key concepts.

Acknowledging the continuity of different scales when thinking the territory, the city, architecture and its materials is the starting point of this method. The key concepts are also essential, stemming from the recognition of critical conditions for housing in great metropolitan areas: diversity, density and economy. Such specific concepts are linked to precise morphological conditions and numerical values. The frequent darkening of intentions and goals by mathematical and apparently scientific paraphernalia is thus replaced by explicit base concepts and procedures which are intelligible to the average professional and public practitioner.

Future development of the method can follow two main lines: on one hand, the extension of its experimental application, reduced so far to a number of selected cases and rather manual tools; on the other, its adaptation to urban regeneration cases. The latter is the subject of a new exhibition to be held in Madrid in 2012.

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